Managerial Advice and the Choice between Bank Loans and Publicly Issued Debt[(1)]

内　田　浩　史
Uchida,　Hirofumi

ABSTRACT

This paper examines the choice between bank loans and publicly issued debt. Compared to publicly issued debt, a bank loan is beneficial because it accompanies useful advice for the firms. It may, however, be the case that the bank's interest conflicts with that of the firm. In this case, the bank intentionally gives a wrong advice and distorts the firm's decision.

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1 Introduction

Firms that want to raise funds usually have several sources, such as equity, bonds, and so on. The distinctiveness of bank loans among others is widely ac-

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knowledged and formally examined in the literature. The present paper investigates this issue focusing on banks' *managerial advice*. This focus is important because banks have an ability to offer a variety of advice. First, the advice can be interpreted as a form of bank monitoring, which is relevant and draws much attention in the corporate governance literature. Bank governance in a bank-oriented economy is considered to be one of the strong counterparts of the governance mechanisms in a market-oriented economy such as a market for corporate control and the board of directors. Tirole [23] discusses the role of *direct monitoring*, in which banks correct information about the borrowing firm and aggressively work on the firm to behave in accordance with the interest of other stakeholders.(2) Managerial advice can be considered as a weaker form of direct monitoring in a sense that banks suggest that the firm behave in a particular way by offering information supportive of that behavior.

Managerial advice is also important in granting loans to growing and establishing firms. Banks usually deal with a lot of borrowers and accumulate expertise. For firms that have a promising technology or an investment opportunity but lacks experience, for example, useful advices given by banks are particularly important. In this case, the advice could be more on financial decision than on real decision. Useful advice by banks on money or financial management, such as advice about cash flow management, an effective use of risk hedging measures and so on, affects the profitability of the investment project the firm has.

Some of the firms, however, can issue bonds as an alternative way of financing. Corporate bonds, including "junk bonds" for establishing firms, are issued

(2) The other type of monitoring is *indirect* monitoring, by which banks investigate creditworthiness of borrowers and use that information in lending. However, the information is used only to determine the terms of lending, and banks do not work on them afterwards to behave in a particular way as in the case of direct monitoring. See Hölmstrom and Tirole [18] as well.

despite the fact that the issuing firms cannot obtain useful advice by banks. Why do some firms choose to issue debt publicly, despite that bank loans accompany useful advice? The aim of this paper is to answer this question by investigating the model which incorporates the advisory role of banks explained above.

The issue this paper deals with is of particular importance for firms in Japan. For majority of Japanese firms, bank loans had long been the sole source of financing. Close bank-firm ties were observed and banks had traditionally had expertise in an advisory role. However, due to the recent deregulation in Japan, it now becomes possible for many firms to utilize diverse sources of financing. Thus the choice between bank loans and publicly issued debt considered in this paper is an issue of practical importance to the current corporate firms in Japan.(3)

In the analysis of the present paper, we consider a firm that tries to raise funds for an investment project. The firm has two alternative financing sources, competing banks or a competitive open bond market. The two sources are assumed to be equivalent except for one point: the firm can obtain potentially useful advice from banks. After the investment was made and before the return realizes, the firm has to choose one of two alternative strategies. This can be considered as a real decision in the context of direct monitoring or a financial decision for establishing firms. The relative desirability of these strategies depends on an unknown state of nature. In the case of publicly issued debt, the firm has to choose a strategy without additional knowledge about the state. In the case of bank loans, however, banks have some expertise and obtain a costly but informative signal about the state. The lending bank reports it to the firm and the firm can choose from strategies based on information obtained from the bank. This may lead to a more efficient strategy choice than the case of pub-

(3) On the financial market in Japan, see, Aoki and Patrick [1] and Hoshi and Patrick [20].

licly issued debt.

There is, however, one shortcoming in bank loans. Banks themselves are one of many stakeholders. In order to maximize the value of his debt claim, the bank does not always report truthfully. The bank's interest may conflict with that of the firm and the bank may intentionally make a false report. Bank loans may therefore lead to an inefficient strategy choice.

It is in this setting that we examine the relative profitability of bank loans and publicly issued debt. Since the firm obtains all the rent in this model, the choice is optimal from the viewpoint of total profit maximization. We will investigate in what conditions bank loans (publicly issued debt) is more preferable. This simple but plausible setting enables us not only to avoid complexity but also to describe distinctively the relative advantage of the two financing sources.

We find that the firm can choose both the bank loan and the publicly issued debt, depending on an exogenous parameter constellation. The bank loan is potentially profitable, since the signal obtained by the bank is useful and the cost of obtaining it is small. Nevertheless, the bank loan can be unprofitable because there is an important condition for the bank loan to be informative: *truth-telling* by the bank. That is, the signal obtained by the bank has to be reported truthfully. This condition is not always satisfied, however, since the bank is a fixed claim holder and the firm is a residual claimant. Due to the difference in the form of their claims, it may be the case that the bank prefers a safer strategy even if it is profitable for the firm to take risky one. In this case, the bank will intentionally make a false report. In this case, no "informative" bank loan equilibrium exists and the result is the same as if no signal were obtained. Due to a positive dead weight loss which is equal to the cost of obtaining the signal, publicly issued debt is more profitable in this case.

Whether the truth-telling condition is satisfied or not depends on several

parameters. To characterize the condition, we then perform comparative statics analysis. One of the two important parameters is the informativeness of the signal itself. The less informative the signal becomes, the more likely the truth telling condition is to be violated. Another important parameter is the relative profitability of the two strategies. The result shows that if one strategy yields too safe or too risky a return, the truth telling condition is violated. This is because the bank's interest is more likely to conflict with that of the firm in this case.

The comparison of bank loans and publicly issued debt is analyzed in a lot of studies. They focus on different aspects of financial intermediary, such as, the reputation effect (Diamond [13] and Chemmanur and Fulghieri [9]), delegation of monitoring (Berlin and Loeys [3]), leakage of proprietary information (Bhattacharya and Chiesa [5] and Yosha [24]), conflict of interest between managers and shareholders (Hoshi et. al. [19]), and a rent extraction from information monopoly (Rajan [22])[(4)].

Amongst others, the paper is closely related to the literature on the *information production role* of financial intermediaries. Banks' monitoring is formalized by Diamond [12], Boyd and Prescott [7] and so on. They examine screening or costly state verification, while our focus is on managerial advice. Also closely related to the present study, Besanko and Kanatas [4] examine an incentive compatibility of information producing intermediaries. However, they focus on an incentive to exert monitoring effort. In the present paper, we focus on intermediaries' incentive to *report* the information. They do not focus on managerial advice, either.

This paper is composed of four sections. The basic model is presented in the

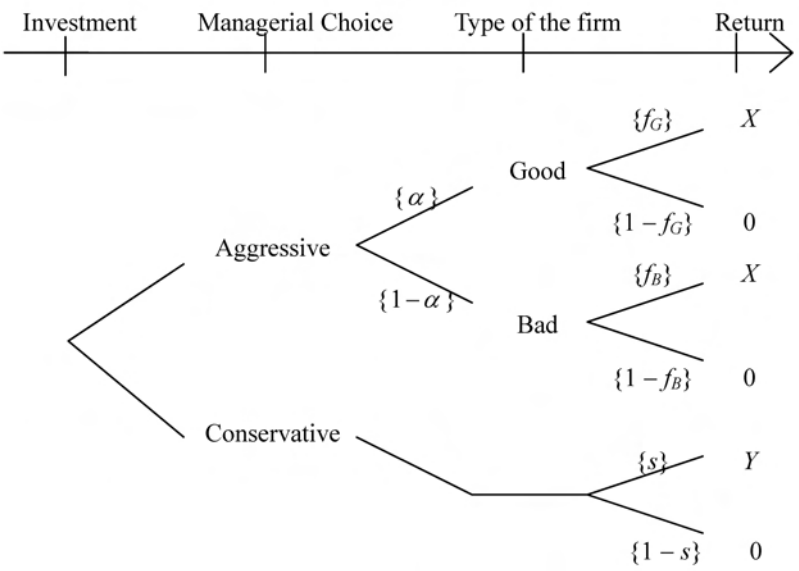
(4) See, for example, Bhattacyarha and Thakor [6] and Freixas and Rochet [14] for a survey of the literature.

next section. In Section 3, we characterize and compare the two equilibria in which the bank loan and the publicly issued debt are utilized. Finally, the last section concludes the paper.

2 Model

There is one borrowing firm who wants to finance an investment project. Figure 1 represents the nature of the project. It first requires an investment I. After the investment has been made and before the return is realized, the firm has to make one managerial decision that affects the level of the return. She must choose one of the two management strategies: "aggressive" and "conservative." If the firm takes the "conservative" strategy, the project yields $Y(>I)$ with probability s and nothing with probability $1-s$, where $0<s\leq 1$. If the firm chooses the "aggressive" one, the return from the project can be

Figure 1: Investment Project



$X(>I)$ (success) or zero (failure). The probability of success depends on the state of nature, $i=G, B$. In the good state $(i=G)$, the project yields X with probability f_G and nothing with probability $1-f_G$, while in the bad state $(i=B)X$ with probability f_B and nothing with probability $1-f_B$. Assume that $0 \leq f_B < f_G \leq 1$. In this paper, no one including the firm herself can perfectly discern whether the state of nature is B or G. The common prior probability that the state of nature is good (bad) is α $(1-\alpha)$.

Under this setting the total expected profit is represented by

$$\Pi^{EA} \equiv \{\alpha f_G + (1-\alpha) f_B\} X - I, \tag{1}$$

if the firm chooses the aggressive strategy. If the conservative one is chosen, on the other hand, the expected profit is

$$sY - I. \tag{2}$$

Without loss of generality, we focus on the case in which the following conditions hold

$$sY < \{\alpha f_G + (1-\alpha) f_B\} X, \tag{3}$$

and

$$f_B X < sY. \tag{4}$$

Inequality (3) implies that (1) is greater than (2). Inequality (4) means, on the other hand, that the aggressive strategy is less profitable than the conservative one once it turns out to be the bad state. If the firm could choose the strategy contingent on the state, the total expected profit would be

$$\Pi^{FB} \equiv \alpha f_G X + (1-\alpha) sY - I. \tag{5}$$

Inequalities (3) and (4) imply that (5) is greater than (1)[5].

The borrowing firm herself has no funds to invest. She must raise funds

(5) We can unfold the analysis and obtain the same results in other case, $\{\alpha f_G + (1-\alpha) f_B\} X < sY < f_G X$. The other two cases are also possible: $sY > f_G X$ and $f_B X > sY$. In these cases, however, one of the two strategies is always desirable and the information about the state of nature is useless.

from other investors. There are two kinds of investors: anonymous investors in an open debt market ("investors") and banks. The two types of investors compete with and among each other. They therefore accept any terms of financing contracts that yield them at least zero profit. Since the number of lenders is out of concern in the present paper, we assume that the firm deals with only one bank. There are, however, many banks who can potentially lend.(6)

The only distinction between the bank loan and the publicly issued debt is the bank's advisory or monitoring role. We assume that only the bank can obtain some signal about the state of nature. Based on this information, the bank advises which strategy to choose. This setting tries to capture the fact explained in Introduction. We could interpret the advice as a form of direct monitoring that constitutes one of the corporate governance mechanisms, or an advice about financial management for establishing firms.

In this paper, we analyze an "interim" signal. This means that the bank obtains a signal about the state of nature *after* the investment was made and before the strategy is chosen. The cost of obtaining it is assumed to be constant and is denoted by c. The signal j takes one of the two values, G or B. It is private information and only the bank can obtain it. He can, however, costlessly report it to other agents. The report itself is observable but not verifiable by third parties. This assumption captures the fact that the banks' advice often takes verbal and informal form.

The signal is soft information and the bank can report falsely without any additional expenditure. The report is, therefore, a "cheap talk." This assumption can be justified since, if there are some good news and bad news, the bank can make a false report by reporting only one of the two.(7) Assume that the prob-

(6) For an analysis about the number of lenders, see, for example, Dewatripont and Maskin [11].

(7) Similar assumption is made in Benabou and Laroque [2].

ability of having signaled j conditional on the true state of nature i is represented by

$$\Pr(j|i) = \begin{cases} \rho \text{ if } i=j \\ 1-\rho \text{ if } i \neq j, \end{cases} \qquad i,\ j = G,\ B,$$

where $\rho \in [\frac{1}{2},\ 1]$.[8] ρ is the probability that the signal brings true information and is hereafter called the "accuracy." The higher ρ is, the more accurate the signal becomes. We assume that ρ is a constant.[9] Applying Bayes rule, we can show the following.

$$z_G \equiv \Pr(i=G|j=G) = \frac{\Pr(i=G,\ j=G)}{\Pr(j=G)} = \frac{\alpha\rho}{\alpha\rho+(1-\alpha)(1-\rho)},$$

$$z_B \equiv \Pr(i=B|j=B) = \frac{\Pr(i=B,\ j=B)}{\Pr(j=B)} = \frac{(1-\alpha)\rho}{\alpha(1-\rho)+(1-\alpha)\rho}.$$

Needless to say,

$$\Pr(i=B|j=G) = 1-z_G = \frac{(1-\alpha)(1-\rho)}{\alpha\rho+(1-\alpha)(1-\rho)},$$

$$\Pr(i=G|j=B) = 1-z_B = \frac{\alpha(1-\rho)}{\alpha(1-\rho)+(1-\alpha)\rho}.$$

It is worthwhile to note that

$$\frac{\partial}{\partial\rho}\{z_G f_G+(1-z_G)f_B\} > 0, \tag{6}$$

and

$$\frac{\partial}{\partial\rho}\{(1-z_B)f_G+z_B f_B\} < 0.$$

(8) Similar but slightly different characterization of information structure is found in Berlin and Loyes [3] and Boyd and Prescott [7].

(9) An earlier version of this paper considered the case in which ρ is also determined endogenously by the bank's incentive. This change brings about additional complication, however. Besanko and Kanatas [4] also examine the incentive to make accurate information.

Note also that if $\rho = 1/2$, the signal is useless. This is because $z_G = 1-z_B = \alpha$ and $z_B = 1-z_G = 1-\alpha$ if $\rho = 1/2$, which implies

$$z_G f_G + (1-z_G) f_B = (1-z_B) f_G + z_B f_B = \alpha f_G + (1-\alpha) f_B \quad \text{if } \rho = \frac{1}{2}.$$

In order to focus on the relevant case in which the signal is useful, we assume that $\rho \geq \underline{\rho}$, where $\underline{\rho}$ is the minimum of ρ that satisfy

$$\{(1-z_B(\rho) f_G + z_B(\rho) f_B\} X \leq sY < \{z_G(\rho) f_G + (1-z_G(\rho)) f_B\} X. \tag{7}$$

Note that the last inequality automatically follows from inequalities (3) and (6).

Since no one can discern the state of nature, she cannot choose strategies so as to obtain Π^{FB}. If the firm could choose the strategies contingent on the signal, however, the second best strategy choice is possible. The total expected profit is then

$$\Pi^{SB} \equiv \{\alpha\rho f_G + (1-\alpha)(1-\rho) f_B\} X + \{\alpha(1-\rho)s + (1-\alpha)\rho s\} Y - 1 - c.$$

To focus on the case in which the information production is valuable, assume

$$\Pi^{SB} > \Pi^{EA}.$$

The financing contract that the firm offers can be contingent only on whether the project has succeeded or not, which is the only verifiable event. In order to examine a relevant case, we assume that no one other than the firm herself can infer the strategy choice by observing the return of the project. That is, whether the return in the case of success is X or Y is not verifiable. Since the firm has nothing to pay in the event of failure, the contract we will examine can be characterized by only the amount paid to the investor in the case of success. We denote it by $R(\geq 0)$. We can interpret this as the standard debt contract. This form of contract is the best the firm can offer.

3 Publicly issued debt and bank loan equilibria

3.1 Publicly issued debt equilibrium

Let us first examine the case in which public debt is chosen. The financing and investment game is an extensive form game of complete information and the timing is represented in Figure 2. At date 0, the firm issues debt publicly. At date 1, the firm chooses a management strategy. The payoff is determined at the final date. We will derive the subgame perfect equilibrium.

First, let us examine the date 1 strategy choice by the borrowing firm that takes R as given. Since the firm will maximize her own profit, the aggressive strategy is preferred if

$$\{\alpha f_G+(1-\alpha)f_B\}(X-R)\geq s(Y-R), \tag{9}$$

and the conservative one is chosen if otherwise.[(10)] From assumption (3), if

$$s\geq \alpha f_G+(1-\alpha)f_B,$$

inequality (9) holds as long as $R\geq 0$. If, on the other hand,

$$s<\alpha f_G+(1-\alpha)f_B, \tag{10}$$

inequality (9) can be rewritten as,

$$R\leq \frac{\{\alpha f_G+(1-\alpha)f_B\}X-sY}{\{\alpha f_G+(1-\alpha)f_B\}-s}. \tag{11}$$

Note that assumption (3) implies that the right hand side of inequality (11) is

Figure 2: Timing of the game of public debt issuance

(10) We assume that the firm chooses the aggressive strategy in the case of indifference.

positive as long as inequality (10) holds.

Second, let us examine the determination of the terms of contract at date 0. Suppose that it is rationally expected that the aggressive strategy will be chosen at date 1. Since the investors accept debt as long as they can gain at least zero, the participation constraint (PC) for the investors can be written as

$$\{\alpha f_G+(1-\alpha)f_B\}R \geq I. \tag{12}$$

If the conservative strategy is to be chosen, on the other hand, the constraint is

$$sR \geq I.$$

The firm sets R so as to satisfy the participation constraint with equality.

In addition to the participation constraint, feasibility requires

$$0 \leq R \leq \min\{X,\ Y\}.$$

The first inequality is, however, automatically satisfied under the satisfaction of the participation constraint. Furthermore, to exclude irrelevant cases, we assume that X and Y are sufficiently large so that the second inequality does not bind. In the following, therefore, we will not consider the feasibility constraint explicitly.

Finally, we have to check if the strategy choice is consistent with the determination of R. By assumption (3), from the viewpoint of the firm's profit maximization (and of the social surplus maximization), it is preferable to choose the aggressive strategy. The consistency then requires that there exists $R \geq 0$ that satisfy both inequalities (9) and (12). This is not the case if inequality (10) holds and

$$\frac{I}{\alpha f_G+(1-\alpha)f_B} > \frac{\{\alpha f_G+(1-\alpha)f_B\}X-sY}{\{\alpha f_G+(1-\alpha)f_B\}-s}. \tag{13}$$

In this case, the well-known "asset-substitution" problem takes place.[11] Since

(11) See, for example, Jensen and Mechling[21].

the firm herself is a residual claimant, she may not act as a total surplus maximizer. For the firm to choose the socially efficient strategy, R must satisfy the incentive compatibility condition (11). That is, R must be sufficiently small. Inequality (13) means that if the conservative strategy is too risky than the aggressive one, there is a conflict between condition (11) and the participation constraint (12).

In order to avoid complexity, we assume that I is so small that no asset substitution problem takes place in the case of publicly issued debt. Formally, assume

$$\frac{I}{\alpha f_G+(1-\alpha)f_B} \leq \frac{\{\alpha f_G+(1-\alpha)f_B\}X-sY}{\{\alpha f_G+(1-\alpha)f_B\}-s}. \tag{14}$$

This inequality means that the aggressive strategy is more risky than the conservative one and the asset substitution problem is circumvented.

In summary, the equilibrium with publicly issued debt is characterized by the following proposition:

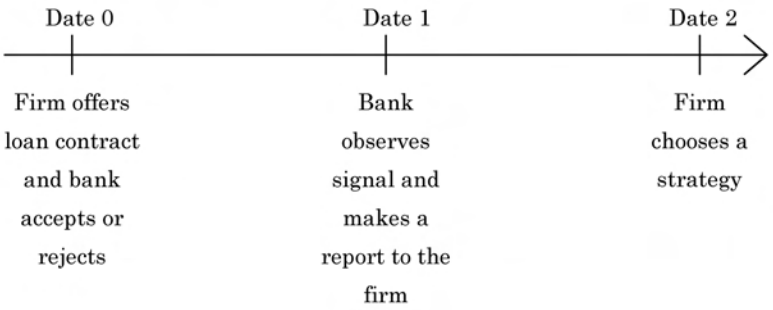
Proposition 1. *The firm offers R so as to satisfy inequality (12) with equality. Her expected profit is,*

$$\Pi^{EA} = \{\alpha f_G+(1-\alpha)f_B\}X-I.$$

3.2 Bank loan equilibrium

We then characterize the bank loan equilibrium. In this case, the timing of the game is depicted in Figure 3. There is an additional date at which the bank receives and reports the signal. The game is an extensive form game of incomplete information and the subgame beginning from date 1 is nothing but one of the signaling games. Furthermore, since the bank can report any signal without any expenditure, this is one of the signaling games with costless signal or

Figure 3: Timing of the game of bank loan



"cheap talk games."[12] We will derive its Perfect Bayesian equilibrium.

As was explained in Hirshleifer [17], Hakkanson et al. [16] and Chan [8], information is of value only if it can affect action. In the present model, therefore, the only relevant equilibrium in which the signal is valuable is the "informative" equilibrium in which the bank reports it truthfully and the firm contingently chooses the strategy. We will therefore examine here whether such an equilibrium exists or not.[13]

To characterize the equilibrium, we will proceed as follows. First, in section 3.2.1, we will derive the condition for the firm to make a report-contingent strategy choice. Second, in section 3.2.2, we will derive the condition for the bank to make a truthful report. Third, section 3.2.3 will examine the design of the contract by the firm. Finally, section 3.2.4 will derive the equilibrium by examining the consistency of the conditions obtained until then.

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(12) See, for example, Gibbons [15].

(13) Unfortunately, irrelevant or uninformative equilibria also exist as in general cheap talk games. In such equilibria, the signal is useless. Obviously, they are Pareto dominated by the informative equilibrium.

3.2.1 Firm's strategy choice

In the first place, let us examine the strategy choice by the borrowing firm. In an "informative" equilibrium, she believes that the report by the bank is correct. If G is reported, on one hand, she believes that the state of nature is G with probability z_G. For her to choose the aggressive strategy, the following must hold.[14]

$$\{z_G f_G + (1-z_G) f_B\}(X-R) \geq s(Y-R). \tag{15}$$

First, if,

$$s \geq z_G f_G + (1-z_G) f_B, \tag{16}$$

assumption (3) implies that inequality (15) holds for all $R \geq 0$. Second, if,

$$s < z_G f_G + (1-z_G) f_B, \tag{17}$$

inequality (15) can be rewritten as

$$R \leq \frac{\{z_G f_G + (1-z_G) f_B\} X - sY}{\{z_G f_G + (1-z_G) f_B\} - s}. \tag{18}$$

From assumption (3), the right hand side of inequality (18) is positive if inequality (17) holds.

If B is reported, on the other hand, the firm believes that the state of nature is good with probability $1-z_B$. The conservative strategy is chosen if[15]

$$\{(1-z_B) f_G + z_B f_B\}(X-R) \leq s(Y-R).$$

First, if,

$$s > (1-z_B f_G + z_B f_B), \tag{20}$$

inequality (19) can be rewritten as

$$R \leq \frac{sY - \{(1-z_B) f_G + z_B f_B\} X}{s - \{(1-z_B) f_G + z_B f_B\}}. \tag{21}$$

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(14) We assume that, in the case of indifference, the firm that received the good report chooses the aggressive strategy.

(15) As before, we assume that, in the case of indifference, the firm that received the report of B chooses the conservative strategy.

From assumption (7), the right hand side of inequality (21) is positive if inequality (20) holds. Second, if

$$s < (1-z_B)f_G+z_Bf_B, \tag{22}$$

inequality (19) can be rewritten as

$$R \geq \frac{\{(1-z_B)f_G+z_Bf_B\}X-sY}{\{(1-z_B)f_G+z_Bf_B\}-s}. \tag{23}$$

Finally, if

$$s = (1-z_B)f_G+z_Bf_B, \tag{24}$$

assumption (7) assures that inequality (19) is satisfied.

Note that these conditions are "structural" form ones, since R is endogenous variable. Below we will derive "reduced" form ones.

3.2.2 Bank's report decision

In this subsection, we will derive the conditions that give the bank an incentive to tell the truth. Suppose the firm believes that the bank is telling the truth. Suppose also that the strategy is chosen contingently, i. e. the aggressive (conservative) strategy is chosen in the case of good (bad) report.

On one hand, suppose that the signal was good. If the bank truthfully reports that the signal was good, the firm will choose the aggressive strategy and the bank's (*ex post*) profit from truth telling is $\{z_Gf_G+(1-z_G)f_B\}R$. If he reports the opposite, to the contrary, the bank's profit becomes sR since the firm will choose the conservative strategy. The truth telling condition for the bank that has received the good signal is thus[16]

$$z_Gf_G+(1-z_G)f_B \geq s.$$

On the other hand, a similar consideration leads to another truth telling condition, which is for the bank who received the bad signal.

(16) We assume that, in the case of indifference, the bank reports truthfully.

$$s \geq (1-z_B)f_G + z_B f_B.$$

In summary, the "truth telling" condition is

$$z_G f_G + (1-z_G)f_B \geq s \geq (1-z_B)f_G + z_B f_B. \tag{25}$$

This condition requires that the posterior (revised) success probability of the aggressive strategy is greater than that of the conservative one if the signal was good, while less than that if the signal was bad. We can easily interpret this condition. Since the bank is a fixed claim holder, he simply prefers a safer strategy and makes a report to induce the firm to choose it. In order for him to report truthfully it is necessary that the truthful report always results in a safer strategy choice. This is what the condition (25) says.

3.2.3 Contract design between the borrower and the bank

In designing a loan contract, the firm has to consider the bank's participation constraint.[17] Suppose that it is rationally predicted that the firm will choose the strategy depending on the report. Suppose also that the bank will report truthfully. Then, the participation constraint is

$$\{\alpha\rho f_G + (1-\alpha)(1-\rho)f_B + \alpha(1-\rho)s + (1-\alpha)\rho s\}R - I - c \geq 0. \tag{26}$$

Among R that satisfy constraint (26), the firm prefers the smallest one.

3.2.4 Bank loan equilibrium

If the "informative" bank loan equilibrium exists, the conditions derived above must be consistent.[18] The conditions are

(17) As before, we concentrate on the relevant case in which the feasibility condition is slack.

(18) Note that we do not have to check the requirement for the off-the-equilibrium-path belief by, for example, the Intuitive Criterion (Cho and Kreps [10]), although we sometimes have to do in signaling games that appear in the standard textbooks. The reason is simple. The informative equilibrium in the present model has no off-the-equilibrium-path information set. If the signaling game had some information set that is reached with zero probability, the truth telling condition fails to hold and the signal is useless.

- the firm's contingent choice (for report G) : (16), or (17) and (18)
- the firm's contingent choice (for report B) : (20) and (21), (22) and (23), or (24)
- the bank's truth telling: (25)
- the bank's participation: (26)

Rearranging these conditions, we can derive the structural form conditions for the existence of the informative bank loan equilibrium

Condition [**C**]

$$\frac{I+c}{\{\alpha\rho f_G+(1-\alpha)(1-\rho)f_B+\alpha(1-\rho)s+(1-\alpha)\rho s\}} \leq \frac{\{z_G f_G+(1-z_G)f_B\}X-sY}{\{z_G f_G+(1-z_G)f_B\}-s}, \tag{27}$$

and/or

$$\frac{I+c}{\{\alpha\rho f_G+(1-\alpha)(1-\rho)f_B+\alpha(1-\rho)s+(1-\alpha)\rho s\}} \leq \frac{sY-\{(1-z_B)f_G+z_B f_B\}X}{s-\{(1-z_B)f_G+z_B f_B\}}, \tag{28}$$

and

$$(1-z_B)f_G+z_B f_B \leq s \leq z_G f_G+(1-z_G)f_B, \tag{29}$$

where "and/or" means that inequality (27) is unnecessary if $s=z_G f_G+(1-z_G)f_B$, and that inequality (28) is unnecessary if $(1-z_B)f_G+z_B f_B=s$.

Inequality (27) is the condition that there exists $R \geq 0$ that satisfy both the firm's contingent choice condition for a good report and the bank's participation constraint. Inequality (28) is the condition that requires that the firm's contingent choice condition for a bad report is consistent to the bank's participation

constraint. These are "no-asset-substitution" conditions. Inequality (29) is the bank's truth telling condition. Assumption (7) implies that one of the former two conditions is slack if one of the two inequalities in (29) holds with equality.

The firm's problem is to maximize

$$\{\alpha\rho f_G+(1-\alpha)(1-\rho)f_B\}(X-R)+\{\alpha(1-\rho)+(1-\alpha)\rho\}s(Y-R),$$

subject to the condition shown above. If inequalities (27) and/or (28), and (29) hold, the firm chooses R so as to satisfy inequality (26) with equality. In this case, the firm obtains

$$\{\alpha\rho f_G+(1-\alpha)(1-\rho)f_B\}X+\{\alpha(1-\rho)s+(1-\alpha)\rho s\}Y-I-c=\Pi^{SB}.$$

We can therefore summarize the result.

Proposition 2. *If condition* [C] *holds, the informative bank loan equilibrium exists. In this equilibrium the firm obtains* Π^{SB}.

3.3 Relative profitability of bank loan and publicly issued debt

3.3.1 Choice between bank loan and publicly issued debt

In this subsection, we compare the two alternatives, publicly issued debt and bank loans. The firm's profit is Π^{EA} in the former and Π^{SB} in the latter. The bank loan yields more profit to the firm. This is an immediate consequence of assumption (8).

One may therefore conclude that the firm always chooses the bank loan. This is not true, however, since there is an important condition for Π^{SB} to realize. We can summarize the result as follows.

Proposition 3. *If condition* [C] *holds, the firm chooses bank loans and the bank offers a useful advice. If otherwise, the bank's advice is useless and the firm chooses publicly issued debt so as to save the monitoring cost* c.

What is important then, is to characterize the condition [C]. Below, we will perform comparative statics analysis and interpret the condition.

3.3.2 Comparative statics

Whether condition [C] is satisfied or not depends on several important parameters. The obvious one is the cost of obtaining the signal, c. The higher c is, the less preferable bank loans become. This can be seen from inequalities (27) and (28). If c is very high, R have to be large enough for the bank to participate (inequality (26)). This may conflict with the contingent strategy choice condition ((18) or (21)).

A parameter which is more relevant is the investment cost, I. This parameter plays a role similar to c. However, I affects the no-asset-substitution condition for publicly issued debt (14), as well.

If c and I are small enough, however, we can show that these conditions are reduced to inequality (29) only. That is, for small c and I, inequalities (28) and (27) are slack as long as inequality (29) holds. Formally, this can be stated as follows.

Proposition 4. *If inequality (29) holds, there exists a positive small number δ for which both inequalities (27) and (28) are slack as long as $I+c \leq \delta$.*

Proof. Setting δ between

$$\{\alpha\rho f_G+(1-\alpha)(1-\rho)f_B+\alpha(1-\rho)s+(1-\alpha)\rho s\}$$
$$\cdot \min\left\{\frac{\{z_G f_G+(1-z_G)f_B\}X-sY}{\{z_G f_G+(1-z_G)f_B\}-s}, \frac{sY-\{(1-z_B)f_G+z_B f_B\}X}{s-\{(1-z_B)f_G+z_B f_B\}}\right\}$$

and zero suffices. Under inequalities (7) and (29), the former is positive. □

This proposition implies that what is most important is whether inequality (29) is satisfied or not. In the following, we will consider the case in which $I+c<\delta$ and focus on inequality (29) only. Note that the result obtained in the proposition depends implicitly on the assumption (7).[19]

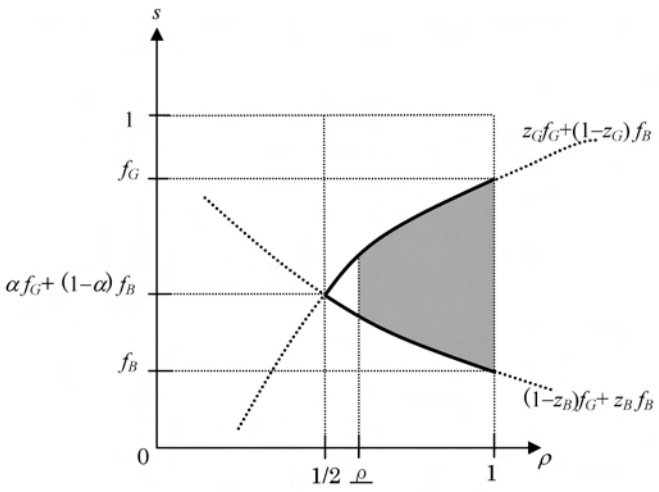
The parameters of our interest in inequality (29) are ρ and s. The former, the accuracy of the signal, affects z_G and z_B. The latter represents a success probability of the project. As for the probability, there are indeed several other probability parameters which affect inequality (29). What is important is, however, the "relative" probability of the aggregate and conservative strategies. Furthermore, since we are assuming inequalities (3), (4) and (7), we should focus on the parameter that does not affect these assumptions. We will therefore examine in the following the effect of s with keeping sY constant.

In figure 4, pairs of (s, ρ) that satisfy inequality (29) are represented by the shaded area. Assumption (7) assures that $\rho \geq \underline{\rho}$. Keeping sY constant, $\underline{\rho}$ does not depend on s and the line $\rho=\underline{\rho}$ is represented by the vertical line. Note again that assumption (7) is made sorely for analytical convenience.

First, inequality (29) implies that ρ *has to be large enough* given s. The meaning of this requirement is as follows. If ρ is sufficiently small, the signal becomes useless. Then, regardless of which signal is obtained, the bank does not alter his belief very much from what he believed *ex ante*. He therefore always concludes that the strategy that was *ex ante* preferable for him, i. e. *ex ante* safer strategy, is still preferable. In order to make the firm choose this

(19) If we drop assumption (7), the asset substitution problem still exists even if $I+c$ is close to zero. That is, even if $I+c$ is very close to zero, we cannot find any δ in R^+ in some parameter constellation. In such a case, we have to consider two forms of agency problem taken together: the one in the firms strategy choice and the one in the banks report. We did not incorporate this unnecessary complication so as to focus on the main issue of this paper, the possibility of banks false report.

Figure 4: Bank's Incentive compatibility condition (sY=constant)



strategy, the bank will always report the same irrespective of the true signal. The signal-contingent strategy choice is therefore no longer feasible.

Second, inequality (29) implies that s *must not be too high or too low* given ρ. The meaning of this requirement is as follows. As was already mentioned, the bank prefers safer strategy, since he is a fixed claim holder. Suppose s is too high or too low to satisfy inequality (29). Then, the bank uncongtingently prefers one of the two strategies. Thus the bank always makes the same report to induce the firm to choose the strategy. This violates the bank's truth telling condition. This may be the case even if the signal has useful information. The typical example in which this occurs is the case of $s = 1$. As long as $s = 1$, the bank prefers the conservative strategy and always reports "bad," even if $\rho = 1$.

This result has some interesting implication. It claims that those firms that have too safe or too risky a profit source (i. e. those with big difference in risk between the aggressive and conservative strategies) will not rely on banks for

managerial advices. This implies that well-established firms that can yield stable profit constantly (as the former) and innovative enough venture business without stable job (as the latter), will not choose bank loans in expectation of his useful advice.

4 Conclusion

In this paper, we compared bank loans and publicly issued debt by focusing on the banks' managerial advice role. Compared to the publicly issued debt, bank loans are beneficial because they accompany useful advice. It may, however, be the case that the bank's interest conflicts with that of the firm. In this case, the bank intentionally makes wrong advice and distorts the firm's decision. We have derived the condition for the existence of the informative bank loan equilibrium.

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